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The evolution of a floodplain aquaculture management system in Bangladesh

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Abstract: A collective floodplain aquaculture (FPA) management approach, developed in the Daudkandi sub-district of Bangladesh, has become popular among local landowners of floodplains for managing aquacultural operation in their lands. Taking inspiration from a small-scale FPA formed by landowners, an NGO modernized the approach when it collaborated with the community in applying the management approach in a larger floodplain in 1996. Since then, the success of the early FPA resulted in proliferation of more NGO-collaborated FPAs and independently-formed FPAs. In this paper, we try to find how this management system has evolved over time in both types of FPAs. By studying 15 FPAs selected from five districts, we tried to identify the modifications in organizational and operational aspects of these FPAs. In the Daudkandi region, we observed that, as the realization of profitability increased among the landowners, they not only formed new FPAs by themselves but also, in some FPAs, tried to confine the rising benefits among themselves by excluding non-landowners' participants. We also found the emergence of professional aquacultural managers who man-

age the aquacultural operation of an FPA by leasing it from FPA's management committee. We conclude that, in the Daudkandi sub-district, the FPAs evolved along the way as users adaptively responded to the problem of lower profits by innovating lease-based management. In other parts of the country, where the FPA trend is relatively new and the FPA management committees were found to be still running the aquacultural operation instead of leasing it, the direction of the evolution should be carefully examined in the context of the community resource management.

Keywords: Collective management, exclusion, floodplain aquaculture, modification of rules and practice

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1. Introduction

The spread of floodplain aquaculture (FPA¹) is one of the accompanying trends of a countrywide expansion of aquaculture in Bangladesh, which, with 1,956,900 tonnes, is the sixth largest producer of cultured fish in the world (FAO 2016). While the spread of overall aquaculture has been observed since the country's independence in 1971, the trend of aquaculture in seasonal floodplain waterbodies is comparatively new. Although there were reports of a stocking-based rise of harvested fish from floodplains since 1988-89 (Ahmed 1999; Islam 1999), numerous studies have reported the recent mainstreaming of the FPA phenomenon (Gregory et al. 2007; Toufique and Gregory 2008; Belton et al. 2011; Haque et al. 2011; Sultana 2012). In addition, the Department of Fisheries (DoF) only began publishing FPA data in its annual Fisheries Resource Survey System report in 2011 (FRSS 2011).

Not surprisingly, the spread of FPA has also witnessed development of several types of FPA practices. Among them, one management system has been regularly featured in various studies – sometimes as the sole focus, sometimes in comparison with other similar practices (Gregory et al. 2007; Toufique and Gregory 2008; Mustafa and Brooks 2009; Sultana 2012; Khan 2015; Bayazid 2016). The development of this management system has been attributed to a non-governmental organization (NGO) called SHISUK², and its collaboration with a community of the Daudkandi sub-district in the Comilla district to form an FPA

¹ In this paper, by 'FPA' we will mean, depending on the context, the floodplain aquaculture as a distinct type of aquaculture practice, and also the collective management group formed by investors for practicing such aquaculture.

² *Shikhya, Shastha, Unnayan Karjakram* in Bengali, which can be translated into English as Education, Health and Development Programme

was widely recognized as pioneering. This first NGO-collaborated FPA (NFPA), Pankowri Fisheries Ltd (*Pankowri*, hereafter), was formed in 1996. While the NGO promotes the management system by referring to it as the Community Enterprise model, it is popularly known as the Daudkandi model of FPA. The profitability of an FPA enterprise, demonstrated by this NFPA, resulted in the proliferation of more than 50 FPAs in the neighbouring communities across a span of two decades. While the NGO promoted and partnered with a few of these FPAs, others were independently formed by landowners from various floodplains. The NGO later expanded their FPA programme in other parts of the country.

However, how this FPA management system evolved over time – in the NFPAs and independently-formed FPAs (IFPAs) – is yet to be adequately explored. Khan (2015) indicated that over the years, some changes have occurred since its first application. Given the common-pool resource (CPR) nature of the floodplain water-bodies, modifications in management systems are not unexpected, as Ostrom (1990, 58) identified that “appropriators designed basic operational rules, created organizations to undertake the operational management of their CPRs, and modified their rules over time in light of experience according to their own collective-choice and constitutional-choice rules”. Identifying and studying such changes will shed light on critical aspects of the collective management of community resources, such as how users responded to the opportunities opened up through improved use of the resources or solved management problems using their experiences over time (Agrawal 2001; Olsson et al. 2004; Carlsson and Berkes 2005; Ostrom 2007; Armitage et al. 2009; Berkes 2009; McGinnis and Ostrom 2014). The purpose of this study is to identify the extent and nature of the modifications – whether uniform or varied, considering the numerous adoptions – made over the last two decades by the participants of the FPAs. By studying organizational and management aspects of FPAs selected from five districts of Bangladesh, this study attempts to articulate those modifications. As this FPA management system was expanded through independent adoptions and NGO-led programmes, the study covers both types of FPAs, with an emphasis on NFPAs.

The article is outlined as follows: Section 2 reviews briefly the development of this management system, followed by a brief theoretical framing of collective FPAs in Section 3. Methodology and data collection are presented in Section 4. Collected data regarding the FPAs are offered in Section 5, and their discussion is presented in Section 6. Section 7 draws some concluding remarks.

2. Proliferation of FPAs by adapting the NGO-promoted management approach

In Bangladesh, 2.8 million ha of water-bodies are formed every year by inundation of floodplains, which is the largest among all inland open water-bodies in the country (FRSS 2017). Most of these floodplains are composed of private lands, which are mainly used for agricultural purposes during dry seasons. However,

because of the historical background of colonialism, the government holds rights over large tracts of floodplains. Regardless of such distinctions, during the monsoon, a floodplain usually becomes a single water-body, connecting lands which are owned by different owners, and sometimes under different property rights regimes. Thus, they become unusable for investment-based resource development or extraction unless some collective arrangement is made among rights-holders about all the aspects of any specific uses. This is more pertinent to the water-bodies that are formed by connecting plots of lands separately owned by many individuals, because individuals cannot exercise the authority of government agencies when annual flooding makes the boundaries among the lands practically ineffectual. In this study, we will solely concentrate on FPA practices in this latter kind of floodplain water-bodies.

Therefore, an FPA initiative in private floodplains seemed difficult or simply inconceivable to implement because of floodplain water-bodies' seasonally differentiated uses and involvement of various numbers of landowners, among other reasons. Formation of an FPA would also require considerable investment in infrastructure because of the water-body's nature, in addition to fish culture related investments. There is also concern over unenforceability of access controls and non-compliance with other rules, which might cause benefits to be appropriated by non-authorized and/or non-investor community members. At the same time, a few scattered initiatives failed due to lack of agreements about and conflicts over sharing costs and benefits, alternative seasonal uses of floodplain lands, etc. (Thompson 2005). Thus, for a long time, floodplain water-bodies in private lands remained mainly the open access source of capture fishery for neighbouring communities.

An adoptable model of collective and self-organized FPA management must demonstrate that such obstacles can be dealt with, and considerable returns can be generated from aquaculture activities in floodplains. The Community Enterprise model initiated in the Daudkandi sub-district in 1996 was reported to meet these criteria (Gregory et al. 2007; Toufique and Gregory 2008; Khan 2015).

However, the SHISUK's collaborative attempt to establish an FPA was not the first of its kind in this community. A small group of landowners started an FPA named *Dhanuakhola Nagarpur Adarsha Motsha Chash Prokalpo (Dhanuakhola)* in a small floodplain of 13.35 ha land in 1984. There had been no other successful FPA in the community until *Pankowri* was formed in 1996. Nonetheless, the precedent of *Dhanuakhola* in the community proved important, as SHISUK cited its profitability in motivating the neighbouring landowners to form *Pankowri*. By forming *Pankowri* in a larger floodplain, SHISUK modernized and improved upon previous practices, devised ways to solve past difficulties, and expanded the scope of collective FPA enterprises.

Figure 1 shows the chronological spread of the FPAs formed under the studied management system. These FPAs were primarily formed in one of two ways. First, following the success of *Pankowri*, SHISUK formed more NFPAs throughout the 2000s in partnership with community stakeholders in various parts of the Daudkandi region. From the early 2010s, the NGO gradually expanded its

The evolution of a floodplain aquaculture management system

253

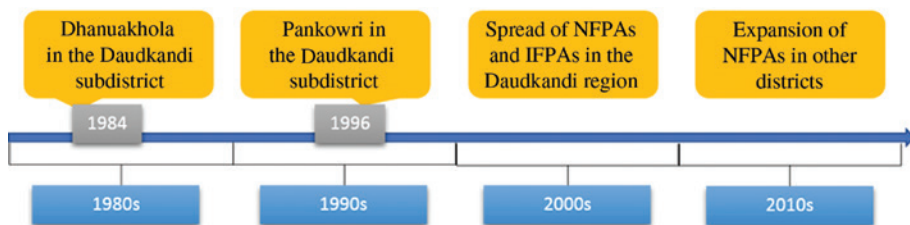


Figure 1: Chronological spread of FPAs based on the studied management system.

FPA programmes in other districts. Second, landowners formed IFPAs by playing leading roles without any NGO involvement. These types of FPAs, formed through flexible application of the NGO-promoted management approach, are very common in the neighbouring communities of the Daudkandi sub-district. The proliferation of IFPAs showed that the development and management of FPAs can happen without the NGO initiative and involvement when community participants successfully engage on their own.

The formation steps and management cycle now generally followed in these FPAs are shown in Figure 2. The green boxes depict the seasonal cycle of aquaculture, such as stocking, nurturing, harvesting, etc., in a floodplain water-body once an FPA has been formed. The yellow boxes show the preliminary forma-

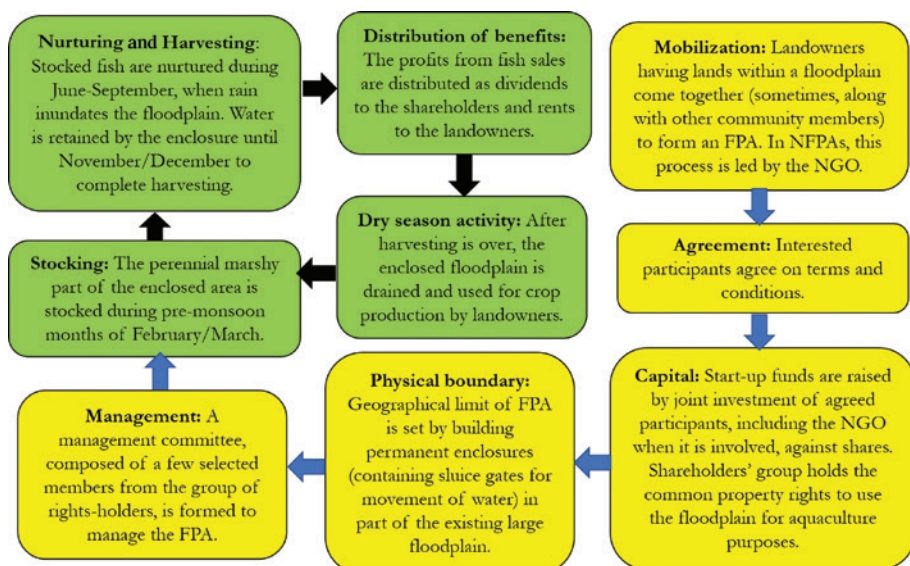


Figure 2: FPA formation and management cycle (Yellow boxes indicate the formation stages and green boxes the annual operations) Source: Adapted and modified from Bayazid (2016).

tion stages of mobilization, reaching agreement, obtaining capital, setting physical boundaries, and forming a management committee. However, in the absence of a successful demonstration prior to SHISUK's intervention, these preliminary stages were perceived to be more difficult, as shown by the lack of collectively managed FPAs.

3. Theoretical underpinnings of NGO intervention and collective management of FPAs

SHISUK's intervention to promote FPAs in various parts of the country can be regarded as an extension of conventional co-management practices. In its classic conception, co-management was understood as sharing responsibilities and authority, primarily between central government agencies and local users, in management of a resource (Jentoft 1989; Berkes et al. 1991; Pomeroy and Berkes 1997; Carlsson and Berkes 2005; Beem 2007). However, through a meta-analysis of co-management interventions in developing countries, Evans et al. (2011, 1940) showed that many "co-management projects involve support by independent organizations or non-governmental organizations, *in place of the state*". This was precisely the role of SHISUK in developing FPAs. The NGO, SHISUK, collaborated with the community in promoting aquaculture practices without any government initiative framework for or involvement in managing FPA enterprises. The involvement of government agencies in similar FPAs occurred only after the trend became popular among landowners. Furthermore, the NGO not only made investments, but also participated in management and day-to-day operations of the FPAs. Therefore, responsibilities and authority were also shared to some extent by community stakeholders (landowners and other shareholders) and the NGO. In contrast, the participation of government agencies was limited to providing financial and technical support, and research collaboration during the project periods in which they collaborated.

In the realm of property rights, there are two aspects regarding the collective management of floodplains for aquaculture operation. One set of property rights determines exclusivity of the owner for benefits and costs accrued by owning and using the resource, along with transferability of these rights through voluntary exchange (Tietenberg and Lewis 2009). Sometimes these rights also authorize the kind of use for the user or user-groups. This type of authorization is more relevant for running FPA operations in floodplains because the same floodplains are used for agricultural production in the dry season. In the collective management of FPA, a group of rights-holders is formed from the members of the community. This group has the sole right to use the specified floodplain for aquaculture operation. However, the lands within the floodplain are the private property of numerous landowners. Therefore, the collective rights of the group to use the lands for their purpose is obtained by the simple mechanism of rent. Each individual landowner transfers their private property rights to the group for a specified period around the monsoon in exchange for a rent fee. In the dry season, the landowners

practise their private property rights by engaging in agricultural activities, mostly rice cultivation.

Another aspect of property rights – consistent with the conceptualization of Schlager and Ostrom (1992) – is related to the bundle of rights, responsibilities, and limitations of the members of the collective group that holds the rights to use the floodplain for aquaculture operations. The rights to the benefits of the aquaculture operation are the basic rights of a member of such a group. These rights are based on the personal investment they made, especially at the beginning of FPA formation. However, the real management and operation of such an FPA is run by a committee composed of a few selected members from the group of rights-holders. This type of management committee (MC) holds the rights to all sorts of collective-choice actions, such as making operational decisions and rules, and operational activities, including harvesting. The rights of ordinary members of the group are limited to benefits according to their investments and sometimes include rights to elect members of the MC. Constitutional-choice actions occurred during the formation of FPAs, and participation in such activities were determined by community members' stakeholding, power relationships, and patterns of the communal decision-making process.

Thus, in collective management of an FPA, common property rights are created for a group of property users, so that they can collectively manage aquaculture operation in floodplain water-bodies. Through the formation of such a group having common property rights, the erstwhile seasonal open access floodplain water-body has been brought under a common property regime. In NFPAs, the NGO is also a common property rights-holder based on its investment, and shares management responsibilities and benefits along with the other shareholders. In all FPAs, irrespective of their formation pattern, the investor rights-holders are now known as shareholders, and those who are selected for managing the FPA affairs are known as directors. Such a management committee is called a board of directors (BoD) or executive committee (EC). These terminologies will be used in this study for simplicity.

4. Study sites and methods

Study sites. The study was conducted on fifteen FPAs, including both IFPAs (five) and NFPAs (ten), so that changes in their organizational and management aspects could be studied side by side. At the time of the study, NFPAs were found in seven districts of Bangladesh. From them, five districts were selected where at least one fully operational FPA was found with records of continuous FPA operations. The sub-districts within these five districts where the FPAs are situated are identified in Figure 3. They are Daudkandi (Comilla district), Harirampur (Manikganj district), Shingra (Natore district), Rajapur (Jhalokati district), and Nazirpur (Pirojpur district). In the four sites outside the Daudkandi region, the FPA trend is relatively new. These sites were selected to explore whether there is any difference between the older and newer FPAs in



Figure 3: Study sites of five the sub-districts (Source: <https://www.google.co.jp/maps/place/Bangladesh/>).

terms of organizational and management practices. It was attempted to select both NFPAs and IFPAs from all sites. However, while more than 50 FPAs – numerous IFPAs, along with six NFPAs – were found to be operational in and

around the Daudkandi sub-district, only a few NFPA that performed continuously through a well-organized institutional scheme were found in the other four sites. As such, eleven FPAs – six NFPA and five IFPA – were selected from the Daudkandi region. One NFPA was selected from each of the remaining four sub-districts.

Data collection. The data were primarily collected using interviews based on a structured questionnaire, supplemented during the field visits by non-structured questions asked as the situations required. Two general field visits were conducted. The first visit (April and May of 2016) was conducted when the FPA staff were preparing the floodplain for the approaching monsoon by stocking part of the floodplain with young fish and/or nurturing them. The second field visit (October and November 2016) was made during the harvesting season.

Principal interviewees included FPA staff, directors, some ordinary shareholders and lease holders. Collected data were checked against official documents wherever it was possible. Besides interviews, some participant observations were also conducted by attending the FPA meetings, harvesting sessions, and other official activities (e.g. election of members of the BoD). In addition to FPA staff, NGO staff were also interviewed. The interviewees included NGO staff of each regional office, the FPA programme coordinator, and the executive director. Three types of data were collected. One type of data focused on the formation and development of the FPAs, including information regarding the mobilization of landowners and other community people, infrastructure, initial investment, landowners, and shareholders, among others. Data regarding management included information about aquaculture operations, the decision-making process, and administration rules and practices. The third category of data focused on changes in the management practices over the years.

5. Modifications in organizational and management aspects of FPAs

The fifteen studied FPAs are chronologically shown in Table 1, with their shortened names in parentheses. In the Daudkandi region, after Pankowri, SHISUK collaborated with the community in forming Khirai, LKS, Chagram, Shanto, and Proshanto, while landowners established IFPAs such as Charipara, Kushiara, Asia, and Shishir. DKK, Raninagar, UB, and Jhonjhonia were the result of SHISUK's collaborative attempts outside the Daudkandi region, and were the earliest NFPA in their respective communities. These four FPAs were originally formed through various projects where different government development agencies participated as facilitating partners. These agencies provided a portion of the infrastructure cost during the formation of the FPAs. However, their involvement was confined to the projects' duration, and after that, the FPAs were supposed to function as other NFPA.

Table 1: Studied FPAs.

	Name of the FPAs	Year of formation	Locality	Size (ha) of the floodplain	No. of landowners	No. of shareholders	Non-landowner shareholders
1.	Dhanua Khola Nagarpar Adarsha Motsha Chash Prokalpo (Dhanuakhola)	1984	Daudkandi, Comilla	13.23	68	68	0
2.	Pankowri Fisheries Ltd. (Pankowri) ^N	1996	Daudkandi, Comilla	85	420	423	3 (1 ^S +2 ^{LN})
3.	Charipara Rupali Agro Fisheries (Charipara)	1999	Daudkandi, Comilla	26.71	158	160	2 ^{LL}
4.	Kushitara Fisheries (Kushitara)	2000	Daudkandi, Comilla	13.35	65	68	3 ^{LL}
5.	Asia Fisheries (Asia)	2001	Daudkandi, Comilla	170	575	575	0
6.	Khirai Fisheries Ltd. (Khirai) ^N	2003	Daudkandi, Comilla	61	305	557	120 (1 ^S +19 ^{LN} +100 ^{LL})
7.	LKS Fisheries Ltd. (LKS) ^N	2003	Daudkandi, Comilla	46.94	213	495	136 (1 ^S +35 ^{LN} +100 ^{LL})
8.	Chargram Fisheries Ltd. (Chargram) ^N	2004	Daudkandi, Comilla	140	519	713	140 (1 ^S +39 ^{LN} +100 ^{LL})
9.	Shishir Motsha Chash Prokalpo (Shishir)	2004	Daudkandi, Comilla	13.35	34	31	3 ^{LN}
10.	Proshanto Motsha Prokalpo (Proshanto) ^N	2007	Daudkandi, Comilla	147	828	806	0
11.	Shanto Motsha Prokalpo (Shanto) ^N	2007	Daudkandi, Comilla	80.13	474	850	101 (1 ^S +100 ^{LL})
12.	DKK Bio-Village O Samajik Motsho Prokalpo (DKK) ^N	2012	Harirampur, Manikganj	54.54	195	497	55 (1 ^S +6+48 ^{LN})
13.	Raninagar Chalan Beel Motsho Community Enterprise (Raninagar) ^N	2013	Singra, Natore	25	86	262	97 (1 ^S +96 ^{LN})
14.	Uttompur Badurtola Motsho Chash Community Enterprise (UB) ^N	2015	Rajapur, Jhalokati	28.04	117	164	47 (1 ^S +46 ^{LN})
15.	Jhonjhonia SHISUK Community Enterprise (Jhonjhonia) ^N	2015	Nazirpur, Pirozpur	37.39	92	242	177 (1 ^S +126 ^{LN} +50 ^{LL})

N=NGO-collaborated FPAs (NFPAs), S=SHISUK, LN=local non-landowner who bought shares, LL=landless shareholders who were endowed shares. (Source: Authors' Survey).

5.1. Shareholder composition and its changes in the FPAs over the years

In all FPAs, the investments were made against issued shares, following the practice introduced by SHISUK in 1996. However, this was not the case of Dhanuakhola, which was formed in 1984. Although the participant landowners of this FPA made individual investments like all other FPAs, and divided profits accordingly, the practice of forming FPAs based on investments made against shares was not common at that time. Under share-based investment, a landowner usually makes an investment in proportion to his landholding amount. Thus, the landowner who had more land was entitled to have more shares. However, in Shishir, all landowners made equal investments regardless of landholding amounts. In NFPAs, there was an additional guideline limiting individual shareholding to 20 shares, even if the landholding amount permitted more shares. However, in newer NFPAs (Raninagar, DKK, UB, and Jhonjhonia), the practice of issuing shares in proportion to landholding amounts was not followed. Rather, any shareholder, including non-landowners, who resided in the community could buy a maximum of 20 shares. Nonetheless, such practices were not applicable to the NGO, as it was an extra-community institutional investor. Its share investment was determined at the mobilization phase by negotiating with the community partners, and the common practice was that the NGO would not invest more than 30% of the total share investment.

The composition of shareholders was significantly different between NFPAs and IFPAs (Table 1). In the NFPAs, the NGO was the largest single shareholder holding 6.62% (Pankowri) to 30% (Jhonjhonia) of shares. Collectively, landowners were the largest group, holding 92.68% (Pankowri) to 35.22% (Jhonjhonia) of shares. In addition to SHISUK and the landowners, other shareholders were local non-landowners, who could be classified into two categories.

One category consisted of local landless people who did not possess any income-generating land. The older NFPAs (Khirai, LKS, Chargram and Shanto) maintained a specific quota of shares for this category. In this type of quota, one share was endowed to one landless person or household. However, among the more recent NFPAs – DKK, Raninagar, UB, and Jhonjhonia – only Jhonjhonia had such a quota (Table 1). These shares were actually allocated from the shares that were bought by the NGO, and the common practice was it endowed up to five percent of its shares to local poor who could not afford to purchase shares. Although SHISUK paid for these shares at the time of the usual investment, these shares were handed over to the landless after the NGO got back its invested money in the form of dividends earned against these shares.

The other category of non-landowners included local well-off people who did not have any land in the floodplain which was under the FPA's operation, but possessed lands in other parts of the community. They included traders and merchants, respected members of the community, elected representatives to local and national government bodies, and ordinary community members. These non-landowner shareholders were known as VIP shareholders.

In the IFPAs, landowners were the major shareholders (Table 1). In most IFPAs, non-landowners were not permitted from the very beginning. Very few

non-landowner shareholders were found in these FPAs – in Charipara, two neighbouring households; in Kushiara, three local religious institutions; and in Shishir, three non-landowners became shareholders by investing equally like other shareholders.

These FPAs were all run by MCs composed of members selected from the shareholders. Given the landowners' overwhelming proportion, only landowner shareholders were permitted to be directors in IFPAs, except for Asia, where three non-landowner directors were found. In these FPAs, MCs were formed through a process of deliberation and negotiation among incumbent and aspirant MC members, and sometimes community leaders. Nonetheless, changes in MCs were irregular and rare in IFPAs. In contrast, in the NFPAs, the general practice was to form a MC for a two year term by holding an election among shareholders. This practice was regularly followed in all NFPAs of the Daudkandi region, except in Pankowri, where the election was not regular. The basic requirements for both directors and voters were to be landowners and shareholders at the same time, although an exception was found in Pankowri, which had one non-landowner director.

However, differences were found in directors' requirements in the newer NFPAs (DKK, Raninagar, Jhonjhonia, and UB) where non-landowners were found in MCs. Here, the basic requirement to be a member and a voter was to be a shareholder. Nonetheless, like the NFPAs of the Daudkandi region, MCs of these NFPAs were also formed for two years. However, in these newer NFPAs, the number of aspirant candidates were few. Because of this, deliberations and negotiations among the few candidates were preferred to elections for forming a new MC. In addition, the NGO staff stated that an election might cause division and conflict among shareholders, as was experienced sometimes in some of the older NFPAs. Nonetheless, the option of an election was officially still available if deliberation failed or general shareholders preferred elections. It may be noted that the NGO did not have direct voting rights in selecting members of management committees, though it held the position of chairman of the MCs in all NFPAs, except Pankowri.

However, the number and composition of shareholders was not static, and this kind of change had a corresponding impact on the formation of MCs. The composition of shareholders changed in two ways. First, share composition changed when shareholders traded shares among themselves and with non-shareholders. The trading of shares, however, was guided by FPA-specific rules, which determined whether a non-landowner could buy shares or not. In all the IFPAs, no new non-landowners could purchase shares; however, the current non-landowner shareholders (e.g. in Charipara and Shishir) could sell their shares to other landowners. In contrast, the non-landowners could purchase shares of NFPAs, except in *Pankowri*.

Shareholder composition also changed when FPA management changed shareholding rules or dissolved shares, as was found to happen in the following FPAs over the years:

Pankowri: In the NFPAs, use of the landowners' lands, the participation of SHISUK, and investments were based on a contract or agreement made at the inception of the FPAs with a valid period of five to ten years. The main reason behind the existence of such a contract was that the NGO was an extra-community participant, and the contract gave the community landowners an assurance that the NGO had no intention of or would not be able to take possession of the property of the landowners in case of default or loss in their collaborative enterprise. Additionally, the contract bound the parties to continue the FPA operation at least for the stipulated period, so that the initial investment costs could be recovered. Finally, the contract gave the NFPA a stable and firm structure for the time being, because within the contract period, no major organizational change was allowed. After expiration of the contract, the landowners might renew the collaboration after reconsidering its terms and conditions, including the nature and extent of involvement of all interested parties.

In *Pankowri*, as per the contract made at its inception in 1996, shares were issued to any interested member of the community, including non-landowners. Moreover, non-landowners were allowed in the MCs (like Raninagar, Jhonjhonia, or DKK). However, in 2008, after the expiration of the first contract period, the landowners decided to renew their collaboration with the NGO but not with non-landowners. Thus, the non-landowners were forced to sell their shares. At the same time, shares were redistributed according to landholding amounts, and the landowners who had not bought shares at the inception were allowed to buy shares. Moreover, landholding was added as a requirement for directors. Now *Pankowri* had only two non-landowner shareholders besides SHISUK, and this was an exception to its general rules. Even some of SHISUK's shares were bought back and dissolved by the MC. However, this kind of curtailing of SHISUK's shares was not found in any of the other NFPAs.

Kushiara: Like *Pankowri*, in *Kushiara*'s early years when not all landowners had invested in shares, there was a provision for non-landowners to have shares. However, over subsequent years, such shares were bought back by making changes in its rules, and the landowners who had not previously bought shares were allowed to invest. Moreover, a previous quota of 5% of the shares to be maintained for local landless people was also revoked.

Proshanto: In this FPA, two hundred shares that had been initially planned to be endowed to landless people and that were bought by SHISUK on their behalf were eventually dissolved by the management of the FPA on the grounds that there were no such landless people in the community who could be eligible for such endowment.

Asia: The landless shares (186) were bought back and dissolved.

5.2. Emergence of lease-based management of aquaculture operation

In the early 2010s, a practice of lease-based management for the FPAs' aquaculture operations emerged in the Daudkandi region. Through a lease mechanism, an FPA transfers its rights to run aquaculture operations – instead of being managed by the shareholders' representative MC – to lessees in exchange for a lease fee paid to the FPA. Like all FPA activities, this leasing-out process was also administered by the FPA's MC. Table 2 shows how the rights and responsibilities were shared between the MC of an FPA and lessees of the aquaculture operation. Through the lease mechanism, a MC's rights to operational activities and related collective-choice actions regarding aquaculture were transferred to a group of lessees. All other rights and responsibilities regarding FPA management remained in the hands of shareholders and their representative MCs.

Eight of the eleven studied FPAs in the Daudkandi region were now managing their aquaculture operation through lease-based mechanisms. In the light of this observation, we can classify the studied FPAs using the scheme shown in Table 3. Besides the categories of NFPAs and IFPAs, the FPAs can be differentiated in relation to the group managing the aquacultural operation, as shown in the columns of Table 3. The aquaculture operations of *Charipara*, *Kushiara* and *Asia*, and the more recent NFPAs were found to be managed by shareholder nominated MCs. In 2007, *Shishir* was the first FPA to adopt a leasing mechanism; however, the mechanism was later significantly formalized by the NFPAs, as discussed in the following paragraphs.

Table 4 contains lease related information of the FPAs that adopted the system. It shows adoption year of the lease-based practice, tenure of the lease contract, number of members of the current lessee group, etc. In addition, it shows the nature of the stakeholding relationships of the lessees, as discussed in the following section.

Table 2: Shared rights and responsibilities in FPAs with leased aquaculture operation.

Major activities regarding management and operation of FPAs	Responsible group	
	Shareholders' appointed MC	Lessee group
Aquaculture operation: stocking, nurturing and harvesting		✓
Collective-choice action regarding aquaculture operation		✓
Dividend distribution to shareholders	✓	
Land rent distribution to individual landowners	✓	
Build/monitor/maintain necessary infrastructure and resource conditions	✓	
Paying compensation for the damage of land and other property of individual landowners/surrounding households	✓	
Decisions about leasing	✓	

(Source: Authors' Survey).

Table 3: Classification of sample FPAs based on management of aquaculture operations.

	Shareholders' representative MCs	Lessee group
IFPAs	<i>Asia</i> <i>Charipara</i> <i>Kushiara</i>	<i>Dhanuakhola</i> <i>Shishir</i>
NFPAs	<i>DKK</i> <i>Jhonjhonia</i> <i>Raninager</i> <i>UB</i>	<i>Chargram</i> <i>Khirai</i> <i>LKS</i> <i>Pankowri</i> <i>Proshanto</i> <i>Shanto</i>

IFPAs=Independently formed FPAs; NFPAs=NGO-collaborated FPAs.

How the leasing system works: The aquaculture operation was leased at the beginning of each monsoon before stocking of the floodplain started. The preferred method of leasing was decided upon by directors of the FPA on behalf of the shareholders. Two methods were common among the FPAs. In the method followed by all NFPAs, a lease circular was distributed in the community. Following the announcement, interested groups of lessees submitted their proposals to the MCs. Through a process of open bidding in the presence of directors, shareholders, and NGO staff, the highest bidder was selected from the proposals submitted. Sometimes this selection was done in a sealed-bid manner. After the selection, a contract was signed with the selected lessee group. This contract stated, among other terms, the tenure of the lease, mode of lease payment, geographical limit of the aquaculture operation, and rights and responsibilities of the parties. Another method of leasing involved a non-public and more informal search for a suitable lessee through personal communications of the directors of the FPA. After the leasing trend became popular, many lessees emerged in the Daudkandi region who engaged in this type of leasing ventures. The directors sometimes communicated with familiar lessees of their communities, and reached an agreement through less formal processes. This type of practice was found in *Dhanuakhola*. A variation of non-public leasing involved internal selection from interested directors of the FPA itself. Subsequently one or more directors leased the aquaculture operation from the MC. In *Shishir*, one interested director leased the aquaculture operation, and then managed it with the help of external lessees of his choice.

Income for the FPA: The main purpose of an FPA was to generate income by running aquaculture operations in the floodplain. As the FPA was not to engage in this operation after transferring its rights to the lessee group, the lease fee it earned from this transfer to lessees became its sole income. This income was distributed as rent to the landowners, as dividends to the shareholders, as salaries to directors and other regular and irregular staff. It was also used for repair and maintenance of the floodplain and infrastructures, and paying compensation for any damage the aquaculture operation caused. The lease fee was usually paid to the FPA in

Table 4: FPAs with leased aquaculture operations and the status of lessees in terms of their stakes in the FPAs.

Name of the leasing FPA	Shishir	Shanto	Proshanto	LKS	Chagram	Khirai	Pankowri	Dhanuakhola
Lease period (years)	3	2	2	2	2	2	1	2
Lease management started in	2007	2011–12	2011–12	2012–13	2012–13	2013–14	2015–16	2015–16
Members of Lessee Group	4	18	19	9	22	18	19	10
Lessee's relations with FPAs	D [T]	S (D ^o)	S (D ^o)	D ^p (S ^o , LM)	S* (D ^o , LM) [T]	S	S [T]	D
	LI	D	D ^p	D ^p	D [T]	S	S [T]	D
	LI (D ^{po})	S (D ^o)	S	S	D	S	D (LM)	D (D ^o , LM)
	LI (S ^o)	S (D ^o)	S	S	D	S (LM)	S	D
		S	D ^p	S	S	S	S (LM)	D
		D ^p	D ^p	S (D ^{po})	S (D ^p , LM)	S	S	LI (S ^o)
		LI (D ^o)	D ^p	LI	S, D ^p	S	D (LM)	LI
		LI (D ^o)	S	LI (D ^o)	S (LM)	S	S (LM)	LI
		LI (D ^{po})	S	LI (D ^o)	S	S	S (LM)	LI [T]
		LI (D ^o)	D		LI (D ^o , LM) [T]	D	D (LM)	LI (LM)
		LI	S		LI	S [T]	S	
		LI (D ^o)	LI		LI (D ^o)	S	S (LM)	
		LI	LI		LI (D ^o)	LI (S ^o , D ^o)	LI (LM)	
		LI (D ^o)	LI		LI (D ^{po})	LI (LM)	LI (LM)	
		LI	LI		LI (D ^o)	LI (D ^o)	LI (LM)	
		LI	LI		LI	LI	LI (LM)	
		LI (D ^o , LM) [T]	LI		LI (D ^o , LM)	LI	LI [T]	
		LI (D ^o , LM) [T]	LI		LI [T]	LI	LI	
			LI		LI	LI	LI	
Percentage (%) of lessees with additional stakes in any FPA	75	83.33	57.89	88.89	68.18	83.33	84.21	70

Insider lessees, who were also authorized members of the leasing FPA, are indicated as: D=incumbent director, D^p=past director, S=shareholder. Outsider lessees, who were not authorized participants of the leasing FPA, are indicated by 'L' in the shaded cells. The stakeholding relations of the lessees with any other studied FPA are indicated in parentheses as: D⁰=incumbent director of another FPA, D^{p0}=past director of another FPA, LM=lessee in another FPA, S⁰=shareholder of another FPA. A lessee who was engaged in an aquaculture related trade is indicated by 'T' in square brackets. (Source: Authors' Survey).

*Only non-landowner shareholder found among the lessees.

equal instalments at the beginning of each aquaculture season, if the aquaculture operation was leased for more than one season.

The lessee group: Every lessee group had a leader with whom the lease contract was formally made. A lessee group was organized in the same fashion as an FPA. Its members invested differently and shared returns accordingly, like the shareholders of the FPAs. However, lessee groups contained far fewer investors than the FPAs, as can be seen from the fact that the largest lessee group had 22 members (Table 4), while the smallest FPA had 31 shareholders (Table 1). Moreover, participation in the lessee group was informal, flexible, and usually limited to the lease period. Nonetheless, there were lessee groups that had formal names and constant core members for managing the group's various lease operations in different FPAs. In any case, the FPAs were found to have no significant prerequisite regarding the manner of formation or number of members of lessee groups.

However, internally the lessee groups had varied members. One important point of variation emanated from the stakeholding relationships that the lessees had with the leasing FPA, in addition to being lessees. Based on these stakeholding relationships, the lessees can be separated into two categories:

- a) Some lessees had additional and direct stakeholding relationships with the leasing FPA as shareholders or directors. This category could be termed as insider lessees.
- b) In contrast, there were lessees who had no stake in the leasing FPA as shareholders or directors. This group can be called outsider lessees.

The nature of these stakeholding relationships is presented in Table 4. The table shows that many of the outsider lessees were actually directors or shareholders of other neighbouring FPAs. Different lessee groups had different characteristics in terms of stakeholding in the FPAs, which can be seen in the last row of the Table 4 showing the percentage of lessees with any additional stake in any FPAs besides lease-holding. Most lessees had FPA related experience in one way or another. In addition, the table also shows information on lessees who were locally prominent traders of aquaculture inputs, such as fish feed, fertilizer, and fingerlings.

6. Discussion

6.1. Participation of non-landowner shareholders

In all types of FPAs, the landowners were the principal and common stakeholders. This is understandable, given that they privately owned the lands within which the FPA operations were conducted. However, non-landowners were also present in all types of FPAs in varied proportions, with important differences in rationale and methods of their inclusion. Below we provide the principle reasons for non-landowners' participation:

1. **Obtaining the necessary capital:** In many FPAs – especially in the early ones – a portion of landowners were sceptical about the profitability of the FPAs and did not make share investment at the time of the FPA formation. These landowners were satisfied with any rent earnings they would receive in exchange for allowing their lands to be used by the FPAs. This was the case because, before the initiation of the FPAs, most landowners had left the floodplains largely unused during the monsoon, and they had earned little, if any, income from their lands in that season. Thus, when the prospect of income from the flooded lands occurred through the formation of the FPA, they were happy to receive rent income without the additional risk of making an investment in the venture. At that time, affluent non-landowners who were ready to take the risk and make the investment were offered shares freely. As we have shown, such participation was mainly seen in the NFPAs, since these FPAs generally followed an inclusive principle by not confining shares to any specific group, such as landowners, when they were initially issued.
2. **Securing support, rule enforcement and leadership:** The group of affluent non-landowner shareholders sometimes included community leaders, locally well-respected persons, or people of political professions, and other potential key community members, such as non-landowners living on contiguous lands of a floodplain. This kind of involvement can be understood from two perspectives found in CPR theories. First, within the institutional model of social-ecological system (SES), as formulated by Anderies et al. (2004), these members of the community could be viewed as providers of ‘public infrastructure’ in the sense that their inclusion could facilitate enforcement of rules. The idea is that their involvement would ensure compliance with rules by participants (shareholders, directors, and landowners) and non-participant members of the community, such as by not poaching, along with quick, effective, and lasting resolution of any conflict. This perception was also reflected in the term ‘VIP shares’ by which such non-landowner shares were known among the FPAs. In addition, this type of inclusion would also guarantee these key non-landowners’ commitment to comply with the rules of the FPA as participants and beneficiaries. The inclusion of neighbouring non-landowners was also found in IFPAs.

Second, the roles played by locally influential people can be perceived from their leadership status within the community (Olsson et al. 2007; Gutiérrez et al. 2011; Stöhr et al. 2014). In our study, we found that the participation – in the form of token endorsement to being a member of the regular decision-making body – of the community leaders and/or locally respected people provided the legitimizing foundation through their approval and support for the FPA initiatives. Moreover, some non-landowners were cited as possessing important managerial skills, demonstrating personal commitment, and taking direct responsibility for the

functioning of the FPAs. Few of these non-landowners ultimately bought lands within the floodplain to further strengthen and legitimize their involvement. It was reported that, in the earlier years of NFPAs, critical leadership roles regarding motivational support, guidance, and commitment were provided by both landowners and non-landowners. This kind of involvement was especially found in the NFPAs, because the NGO itself is an extra-community entity.

3. **Poverty alleviation:** Landless community people were included to make the FPA initiative socially more beneficial. While the presence of landless community members was almost non-existent in the IFPAs at the time of the study (Table 1), in NFPAs their endowment-based inclusion was reported to mainly depend on their presence in the community and ability to invest in shares. In most of the NFPAs where there was no landless quota, and in *Proshanto* where planned allocation of such shares was ultimately cancelled, official staff reported that, in their community, there were no ultra-poor landless people who could not afford to buy shares. As these shares were endowed by the NGO from its own shares, we asked whether it conducted any survey to get information about local landless people before allocation of such shares. It became apparent that the NGO made its allocation decision upon information provided by the community leaders and landowners at the time of formation of the FPA or by the directors of the FPA rather than on any kind of survey. Therefore, the inclusion of local poor largely depended on how they were represented or reported by the community leaders or local members of the FPA management.

The first two points explained why shares were not issued in proportion to landholding amounts and why non-landowners were found in MCs of *Raninager*, *Jhonjhonia*, and *DKK*, or even in *Pankowri* in its early years. Interestingly, while the participation – and subsequent exclusion in *Pankowri* – of the affluent non-landowners in the MCs was observed in some FPAs, this had never been the case for the landless shareholders as they had never been members of MC in any FPA. Our observations from the field indicated that, to some extent, the absence of the landless in decision-making process was caused by the fact that the inclusion of the landless people was based on endowment rather than on their active involvement in and support for the FPAs and/or on their socioeconomic importance within the community. It should be noted in this connection that, although the NGO allocated shares to local poor in many communities, it didn't make any attempt to include these people in the MC. While it was difficult to predict the outcome of such attempts in their absence, the NGO perceived its share endowment more as financial assistance similar to social safety net support rather than as empowerment programme for the ultra-poor. In addition, participation of the landless was impossible in many FPAs as no type of non-landowner was authorised to become member of the MCs in these FPAs.

However, arrangements for non-landowners' participation were not permanent, as we have seen in *Pankowri* or *Kushiara*, where non-landowners were eventually excluded. The reason for this change could be found in the growing realization among landowners of the profitability of FPA enterprises. This realization was expressed in the unanimous responses of the interviewees about the increase in fish yield and resultant increase in income from the FPAs over the years. This enhanced realization can also be easily appreciated from the expansion of the FPAs, and the ways access rules were modified. On one hand, only the prospect of a lucrative return motivated the landowners to collectively start aquaculture in their lands. At the same time, many landowners who had not previously bought shares ultimately became eager to obtain a share of the rising profits. Thus, the early role of the non-landowners as investors in an FPA became unnecessary, as the landowners themselves were now keen to invest in this profitable venture. In the IFPAs, the landowners as principal organizers were not usually willing to include non-landowners unless their inclusion helped the functioning of FPA management (as mentioned above); in a few IFPAs, like *Kushiara*, where non-landowners were involved, they were asked to leave. This was also observed in NFPA such as *Pankowri*.

The exclusion of non-landowners indicated the attempt to confine the benefits to as few people as possible. In some FPAs, this resulted in concentration of shares among only the landowners whose claims to participation and benefits would be rather difficult to ignore because of their ownership of the lands of the floodplains. Consequently, landownership within the floodplain – which has always been an important determinant for user's access rights in the FPA because of the private ownership of lands within floodplains – ultimately became the most important factor in gaining access rights and making legitimate claims to the benefit of the FPAs. Only those non-landowners who were too important to exclude remained as shareholders, such as national-level political figures or highly influential community members. Thus, in *Pankowri* and *Kushiara*, all this resulted in inclusion of erstwhile non-shareholder landowners and exclusion of non-landowner shareholders.

The heightened realization of profitability also resulted in cancellation of shares that had been endowed to the landless, as was found in *Asia* and *Kushiara*. Regarding landless shares, a few FPA staff members – both from IFPAs and NFPAs – complained that some landless shareholders had sold their shares when they faced financial difficulties, and thus made the provision to provide support for them by endowing shares pointless. Although the efficacy of earnings from only one share in alleviating poverty of a landless poor household may be questioned, it should be mentioned that in NFPAs, most landless shareholders kept their shares. This is supported by the observation that the number of landless shareholders remained the same in these FPAs over the years. However, in the NFPAs, trading of endowed landless shares was not permitted, and if any landless shareholder traded his endowed share, that share would be cancelled. Thus, although a few FPA staff suggested that trading of landless shares occurred, they

had no documented record of such trading since no shareholders ever reported any such transaction. Whatever may be the case, in the context of a prevailing tendency to confine profit among as few people as possible, selling of shares by landless shareholders prompted some FPAs' managements to dissolve landless shares.

In addition, an understanding also common among landowners was that non-landowners' participation might have a negative impact on the FPA and on their property. This was because, as the non-landowners did not have any ownership stake in the floodplain, their participation in management might result in irresponsible operational decisions, and thus might damage lands, neighbouring houses, the related infrastructure, or disrupt the seasonally alternative use of the floodplains, among other concerns. The absence of non-landowners in the IFPAs from the beginning indicated that such concerns had been always there in some degree. Nevertheless, it is possible that these concerns were accentuated by the FPAs' rising profitability and consequent increased profit consciousness.

However, in most NFPAs – *Khirai*, *LKS*, *Chargram*, and *Shanto* – the inclusion of non-shareholder landowners was slow and gradual, and did not result in exclusion of any non-landowners. This non-exclusion can be explained through three observations. First, these FPAs were formed a few years after the formation of *Pankowri*, and by that time the profitability of the FPAs was clearly demonstrated. Thus, from the beginning, most of landowners bought shares in these FPAs and only a few were left out for personal reasons, such as absence of the household chief or disputes over land ownership, etc. Second, the non-landowners (besides the local landless) shareholders were mostly local elites whose involvement was more of a token endorsement than any real involvement in the FPAs' management. In addition, even if any non-landowners wanted to participate in the FPAs' management, such involvement was institutionally impossible as no non-landowner was allowed to be a member of an MC or a voter for selecting such members, according to the FPAs' rules. No non-landowner MC member was found in any of these FPAs. It is noteworthy that, unlike the first NFPA *Pankowri*, where non-landowners were initially allowed as members of a MC, in the following FPAs, the landowners' exclusive rights to the MC was in effect from the very beginning. This change in rules attested the landowners' increased readiness to participate in FPA ventures and heightened realization of profitability from them.

Finally, the continued participation of landless shareholders in these IFPAs indicated that this was caused by the presence of the NGO in these FPAs. Nonetheless, the interviewed directors of these FPAs expressed no objection against the continued sharing of benefits by non-landowners. Some held the view that since these non-landowners lived around the cultured water-body, their inclusion would bring about their assistance, support, and compliance with FPA rules as beneficiaries of the enterprise.

Nonetheless, even in these NFPAs, the number of landowner shareholders were reported to increase over time. This increase mainly resulted from the FPAs' rules regarding election of members of the MCs. On one hand, since only landholders of a specified amount of land could compete in such elections in

these FPAs, it was reported that a few non-landowners bought or acquired lands through inheritance to become members of MCs. Having the required amount of land in one's own name was important, because parents' land could not be used for voting or candidacy purposes. However, since transaction of shares was allowed in these FPAs, acquiring shares was cited to be easier than acquiring land. On the other hand, as the voter was also required to be a landowner and shareholder, some candidates bequeathed the required amount of land and shares – which was very small – to his lawful inheritor to increase his number of votes. Every voter was important, because MC members were separately elected from each of the villages that surrounded a floodplain. Thus, in each village, the actual number of voters was not many. It was reported by FPA staff that they had to frequently update their official records for these new landowners and shareholders before elections.

Therefore, it became evident that there was a gradual increase of the proportion of landowners in shareholder composition in the studied FPAs of the Daudkandi region. With the increased realization among landowners of profitability, the support of non-landowners became redundant and their sharing of benefits was perceived as an unwelcome extraction of benefits by outsiders at the expense of landowners' more rightful claims. The idea of non-landowners' involvement, especially the affluent ones, was now generally perceived by landowners as a meddling attempt, because access rights to FPAs were now being legitimized in terms of landownership more than they were at the beginning of the FPA trend. Even for the NGO, the priority in the Daudkandi region was to keep the landless. Interestingly, the involvement of the NGO was also viewed by a few landowners as unnecessary. SHISUK's share reduction and removal from MCs' chairmanship in *Pankowri* were the result of a few landowners' opposition to its continued involvement in the FPA.

However, a few interesting exceptions were found in the landowners' general attitudes toward non-landowners in those FPAs where the latter group was excluded or not allowed at all. In *Asia* and *Pankowri*, exceptions were made to the general rule to include non-landowner directors in MCs. Moreover, these non-landowners were found to not even be shareholders. In the case of *Pankowri*, we learned that such an exemption which was made for *one* non-landowner was attributable to his power relations within the community. This exception to organizational rules stood in sharp contrast to other NFPA, where aspirant non-landowners were found to abide by the rules and bought or obtained land through inheritance to fulfil the landholding requirement of a director. This indicates that, in some cases, the community's internal dynamics of power relationships could be a direct determinant of the inclusion (and possibly the exclusion) of non-landowners, along with their type and continuity as participants. Such inclusion or exclusion ultimately translated into facilitation or contestation of the enforceability of the rules and functioning of FPAs in the community. For NFPA, this signified that SHISUK's role in maintaining the NFPA's organizational integrity was also shaped by such community power dynamics.

6.2. The innovation of lease management and rise of professional lessees

During the last two decades in the Daudkandi sub-district, the shareholders and directors of the FPAs experienced many difficulties. Topping the list was unsatisfactory profits or outright losses, leading to lower than expected or no dividends or land rents. In this respect, there were frequent mentions of various issues surrounding the management committees' handling of FPA affairs. These included complaints about inefficient management of aquaculture operations by the MCs, lack of cooperation and mistrust among the directors, along with typical allegations of financial embezzlements, among others. The transfer of the FPA's income generating function, aquaculture operation, through leasing mechanisms to lessees was innovated by the participants of the FPAs as a solution to these problems.

Many interviewees reported that the primary reason for transferring the management risk and responsibility to a lessee group through lease management was to solve two major problems the FPAs were facing. First, the problem of lower profit or loss was solved through the lease mechanism because, under this mechanism, the lease fee became the income of the FPA instead of sales revenue from fish generated by aquaculture, upon which its profit previously depended. Moreover, the lease fee was riskless, because an FPA earned it without engaging in aquaculture operations, and thus without making any of the usual operational expenditures related to such operations.

At the same time, since the challenge of managing aquaculture was transferred to the lessees, and how they managed that operation had no impact on the income of the FPA, this solved the second major problem hurting the income of an FPA resulting from any mismanagement of aquaculture operations by the responsible management group. In Table 4 we showed that many of the lessees (58% to 84%) were in fact, one way or another, related to the FPAs. Many respondents expressed the opinion that, under the lease-based system, the lessees – whether they were directors in the new role of lessees or any other outsider lessees – could hardly afford mismanagement of aquaculture operations, since the stakes for the few lessees were personal and high. The lessees ran the aquaculture operation by making considerable personal investments rather than managing irresponsibly the investments made by the shareholders of the FPAs.

The interviewed lessees were found to be motivated to take risks to make an investment in leasing aquaculture operations, and mentioned the prospect of profits from such ventures as motivations behind such involvement. Thus, the lessees could be viewed as a new type of fishermen whose involvement in aquaculture was of an entrepreneurial nature. This was despite the fact that most of them had little or no experience in fish farming before the introduction of FPAs in their communities. However, as we have shown in Table 4, many lessees were either insiders of relevant FPAs or stakeholders of other FPAs, and gathered years of fish farming experience through managing the FPAs as directors. A few also cited their experiences in managing private pond aquacultures. More importantly, they were now aware of the profitability of aquaculture enterprises in floodplains.

While as FPA directors they could still earn remuneration for their services, those who were involved in leasing reported that they made higher income from higher investments. In addition, when someone managed the aquaculture operation as a director of an FPA, the losses as well as profits of the FPA were shared among all shareholders, and the portion of their personal loss or gain was not large. There was also mention of additional income in the form of commissions as the result of large scale and/or continuous purchase of aquaculture inputs from suppliers. Since this income was only accessible to those who were making decisions and managing the aquaculture operations, the directors in their roles of lessees could still benefit from such income.

The size of the lessee group was usually small (Table 4), and corresponded to the average size of MCs. Like the members of the MCs, the lessees were responsible for decisions about stocking, harvesting, managing, and other aspects of the aquaculture operations. Nonetheless, the extent of their involvement was greater than the usual managerial role of members of MCs because it was based on their considerably higher investment and resultant higher personal commitment to aquaculture operations. Some lessees were also found to manually participate in harvesting and other fish culture activities alongside the employed staff and labourers, like any other fishermen, as a part of direct monitoring.

At the same time, many lessees also held leases in FPAs of neighbouring communities as members of the same or different lessee groups. For example, the lessee group of the Dhanuakhola FPA was found to manage several other FPAs. Thus, over time, there emerged a class of professional lessees who worked as investor-managers, and were specialized in the management of lease-based aquaculture activities. It can also be said that the rise of these professional lessees and lease-based management of FPAs' aquaculture operations were two mutually reinforcing developments.

However, growth of aquaculture related professions was not limited to lessees, as the spread of FPAs was accompanied by the rise of various input suppliers and output forwarders in the Daudkandi sub-district (Gregory et al. 2007; Toufique and Gregory 2008). In the other four sites, the FPA trend was too new to have resulted in the growth of such professions.

When the staff and shareholders of Charipara, Asia, and Kushiara were asked why they did not adopt lease-based management of aquaculture operations, they responded that they were continuously making profits and the landowning shareholders were happy with their management. While we did not collect any time series information on revenues of these FPAs, a glance at the FPA profits for the season 2015-16 showed that these three were among the eight FPAs which did make profit in that season.

7. Concluding remarks

This study aimed to trace the major organizational and management modifications that were introduced by participants of the FPAs as they experienced altered incen-

tives and new challenges in the process of their continuous collective attempts. In the course of the study, the NGO SHISUK's contribution in the development of FPAs in the Daudkandi region and the recent spread of the trend in other parts of Bangladesh was corroborated. However, after SHISUK's intervention in the Daudkandi region, the expansion of FPAs was boosted by a trend of bottom-up adoption, where landowners formed FPAs to collectively manage aquaculture in their lands. Although the NGO remained as a non-landowner institutional partner in the NFPA, it was the landowners – either as principal participants or sole organizers – who played the major role in subsequent evolution of FPA management and organizational practices. While the landowners were always the most important participants in these FPAs because of their ownership of the lands of the floodplains, this aspect gradually became the most important factor in determining users' rights in some FPAs.

This transformation has important implications for CPR theories. For example, within the SES framework (Ostrom 2007, 2009; McGinnis and Ostrom 2014) this feature of private ownership of floodplain lands can be perceived as a component of a Governance System (GS), or even as a component of a Resource System (RS), because this private property regime was not directly used to govern the collective use of the floodplains. Nonetheless, this feature has an important impact on the collective action situations regarding FPAs, as shown in this study. Regardless of within which first tier of the SES framework we place this feature of the studied floodplains, our findings indicate that the significance of this feature as a determining factor of actors' behaviours, and therefore, of outcomes, increased over time. This suggests that the importance of a variable in the governance of CPR can be changed over time as a result of the modified perception of a variable and its use among actors. In addition, this finding reiterates the continuous challenge of 'developing methods for studying the evolution of action situations over time' (Ostrom 2011, 23).

The participants introduced changes in the FPAs' organizational composition and management practices in light of what they experienced and learned over the years. In this process of experiential and experimental learning-by-doing, the NGO has also been a partner. These two – adaptive management and the linkage characteristics of co-management – are the basic components of adaptive co-management (ACM) (Plummer et al. 2012). However, whether the modifications that were implemented in the FPAs can be called ACM depends on whether they meet the core components, features, and necessary conditions for an ACM (e.g. Plummer et al. 2013) or how they compare with an ACM-based assessment of natural resource management (e.g. Stöhr et al. 2014). Such evaluations can be made in future studies methodologically built on ACM frameworks. Nonetheless, lease-based management was an adaptive development because it was innovated by shareholders to solve the problems of financial performance. Thus, to some degree, the FPAs evolved through participants' capacity to respond adaptively in the face of challenges they experienced. Although our study found that most, but not all, interviewed shareholders were happy with the outcomes of lease-based

management, the question whether the lease mechanism led to effective and efficient financial and non-financial management of aquaculture operation requires further inquiry.

Meanwhile, as illustrated in this study, many later developments regarding FPAs were responses – such as the proliferation of FPAs in the Daudkandi region, and landowners' attempts to become rights-holders or concentrate among themselves the increasing flow of benefits – that resulted from modified incentives brought about by the community's integration with the market (cf. Pender and Scherr 1999; Agrawal 2001; Gebremedhin et al. 2004; Tucker et al. 2007; Cinner et al. 2012). In the case of the present study, the community's integration with markets through development of FPAs occurred with the help of the NGO. Although its involvement was not limited to that role, since it has been continuously shaping the management of the FPAs and governance of the floodplain water-bodies, its capacity in these roles is to some extent determined by the dynamics of a community's internal power relationships, as can be seen from the example of *Pankowri*. Thus, an important area to be explored in future research can be the dynamics of communal power relationships and their impact on the governance of floodplains and management of their uses.

Of the five studied sites, no other site showed developments like those of the Daudkandi region. These developments, including lease-based management of aquaculture and the rise of professional lessees, were the results of more than two decades of FPA expansion in and around the Daudkandi region. Although the interviewees from the other four sites reported few aquaculture initiatives besides the NFPA, their number, level of fish production, revenues, and community participation have yet to reach what we observed in the Daudkandi region. Nonetheless, the direction of the FPA evolution in these regions should be carefully examined in the particular context of expanding FPA trends and the overall context of community-based CPR management.

In any case, the introduction of aquaculture in seasonal floodplain water-bodies is an altered way of using existing resources. This altered way entails not only new management practices underpinned by newly defined property rights-holders, but also new levels of involvement from the rights-holders. Enhanced use of the floodplain to obtain higher yield requires a higher degree of involvement from the authorized and contributing users. In the context of heightened awareness of profitability of FPA enterprises, the twofold challenge for the future will be, first, how the local poor or marginal community members can claim or maintain endowed claims over time of benefits for which they made no contribution, and second, how the benefits from FPAs can be made more wide-ranging through continued inclusion of non-landowners.

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